REMARKS

I. Introduction

In response to the Office Action dated June 3, 2005, claims 4 and 9 have been amended. Claims 1-22 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Allowable Subject Matter

In paragraph 8, the Office Action indicates that the subject matter of claims 21 and 22 would be allowable if written in independent form including all of the limitations of the base claim and any intervening claims. The Applicant acknowledges the Office Action's indication of allowable subject matter, but traverses the rejection of claims 1-20. Should the rejection of these claims be maintained, the Applicants will make suitable amendments to present the allowable claims in independent form.

III. Specification Amendments

The specification has been amended to correct an error. Beginning on page 6, line 25, the specification recited:

> The triangle 508 is defined by connecting the centroids 210 of three adjacent elements 112. As illustrated in FIG. 5A, the centroid of first element *1b* in the first row 502A of elements, the centroid of a second element *1c* in the first row of elements 502A, and the centroid of a third element *2b* in a second row of elements 502B all define a triangle 508. The elements 112 can thus be considered to be arranged in a general triangular configuration. Although the stagger distance S may be set to ½ V (in which case triangle 508 would be an isosceles triangle), it is preferable that the stagger distance S to not be restricted to ½ V, (e.g. by choosing S and V such that S/V is between zero and one) thus providing a generally asymmetrical grating lobe pattern that can be advantageously used to compliment the inherently asymmetrical coverage area typically used in geostationary satellites 100 transmitting signals to certain geographic areas such as the continental United States (CONUS).

As stated, the preferable non-isosceles triangle embodiment described above (and illustrated for example in FIGs. 5A and 6A) uses a stagger distance S of other than ½ V. However, this is not

necessarily the result if S and V are chosen such that S/V is between zero and one.[1] Hence, the statement in the parens "(e.g. by choosing S and V such that S/V is between zero and one)" is in error, and should be deleted.

IV. Claim Amendments

Applicant's attorney has made amendments to the claims as indicated above. These amendments were made solely for the purpose of clarifying the language of the claims, and were not required for purposes of patentability.

V. Non-Art Rejections

In paragraphs (1)-(2), the Office Action rejects claims 4-13 and 15 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

The Office Action indicates that in claim 4, "the distance V" has no antecedent basis. The Applicant thanks the Examiner for noting this error. Claim 4 has been amended to depend on claim 3, which provides the required antecedent basis.

The Office Action indicates that in claims 5, 6, and 9-12, that "H" has no antecedent basis. The Applicant thanks the Examiner for noting this error as well. Since claim 4 now depends on claim 3, which provides antecedent basis for "H" and because, claims 5, 6, and 9-12 ultimately depend on claim 4, the Applicant believes that "H" now has antecedent basis.

The Office Action indicates that claim 9 is unclear. Claim 9 has been amended to recite that $S \cong 0.496V$.

The Office action indicates that the phrase "the distance from the first row of elements" of claim 16 has no antecedent basis. The Applicant respectfully disagree. Claim 16 depends on claim 15, which recites:

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[1] For example, $S = 1/2\,V$ may also be expressed as $S/V = 1/2$ by simply dividing both sides of the equation by V, and $1/2$ is certainly between zero and one.

The apparatus of claim 1, wherein the plurality of elements comprises:
a first row of elements extending in a first direction;
a second row of elements, parallel to the first row of elements;
a third row of elements, parallel to the first row of elements and the second row of elements;
wherein the second row of elements is disposed between the first row of elements and the third row of elements; and
wherein the second row of elements is offset from the first row of elements in the first direction and the third row of elements is offset from the first row of elements in the first direction by a stagger distance S that varies as a non-linear function of ***a distance from the first row of elements*** *extending in a second direction perpendicular to the first direction.*

Antecedent basis for claim 16 is provided by the **bolded** portion of claim 15.

VI. The Cited References and the Subject Invention

A. The Fraser Reference

U.S. Patent No. 6,384,516, issued May 7, 2002 to Fraser discloses a hex packed two dimensional ultrasonic transducer arrays. The two dimensional ultrasonic transducer array is suitable for three dimensional phased array scanning and is formed of hexagonally close packed transducer elements. In a preferred embodiment the transducer elements have a rectilinear shape, allowing the array to be fabricated with conventional dicing saw processes.

VII. Office Action Prior Art Rejections

In paragraphs (4)-(5), the Office Action rejected claims 1-4, 7, 14-17, and 19-20 under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 6,384,516 (Fraser). The Applicant respectfully traverses these rejections.

With Reference to Claims 1 and 4: Claim 1 recites:

A direct radiating array (DRA), comprising:
a plurality of elements, collectively defining a DRA main lobe nearest a DRA boresight and a set of grating lobes nearest the DRA main lobe,
wherein each of the grating lobes in the set of grating lobes is angularly displaced from the main lobe by a grating lobe angle that varies asymmetrically about the DRA main lobe.

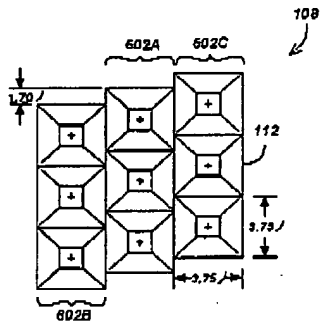
Claim 1 recites that each of the grating lobes are angularly displaced from the main lobe by a grating lobe angle that varies asymmetrically about the DRA main lobe. On page 3, the Office

Action indicates that Fraser discloses this feature, but does not indicate where such feature is disclosed. The Applicant has reviewed the Fraser reference, and can find no such disclosure.

One of the key advantages of the Applicant's invention is described in the specification:

> The elements 112 can thus be considered to be arranged in a general triangular configuration. Although the stagger distance S may be set to ½ V (in which case triangle 508 would be an isosceles triangle), it is preferable that the stagger distance S to not be restricted to ½ V, (e.g. by choosing S and V such that S/V is between zero and one) thus providing a generally asymmetrical grating lobe pattern that can be advantageously used to compliment the inherently asymmetrical coverage area typically used in geostationary satellites 100 transmitting signals to certain geographic areas such as the continental United States (CONUS). (Specification, page 6 line 29- page 7, line 5)

An exemplary DRA is shown in FIG. 6A:



This DRA results in grating lobes which are angularly displaced from the main lobe by a grating lobe angle that varies asymmetrically about the DRA main lobe, as shown in FIG. 6B:

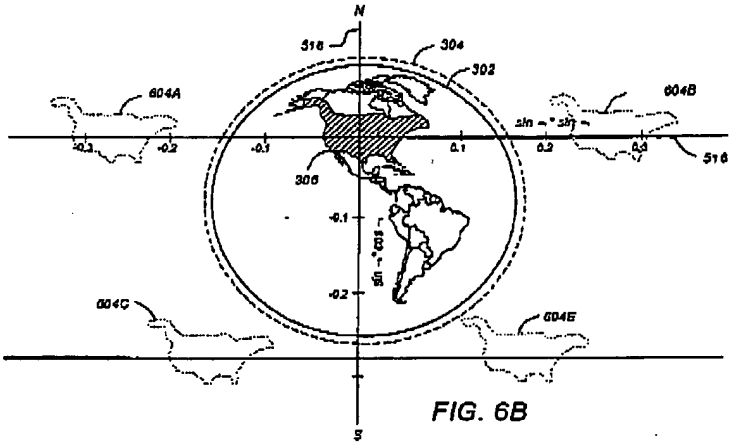
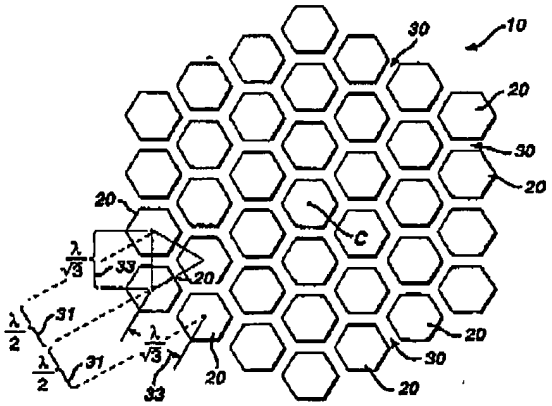


FIG. 6B

In an embodiment described in claim 4, the stagger distance $S \neq \frac{1}{2}V$, resulting in the non-isosceles triangle geometry, and the asymmetric grating lobes. This creates an asymmetrical grating pattern can be used to complement the typically asymmetrical coverage pattern of geostationary satellites transmitting to CONUS (see specification, page 7).

The Fraser reference fails to disclose a DRA having asymmetrically varying grating lobe angles or a DRA having the necessary characteristics to create such asymmetric grating lobes. In fact, Fraser teaches a stagger distance of $S = \frac{1}{2}V$. Note, for example, that FIG. 1 shows a system in which the stagger distance forms an isosceles triangle with $S = \frac{1}{2}V$ (the Applicant has modified FIG. 1 to include lines between the center of the elements to show the iscosceles structure)::

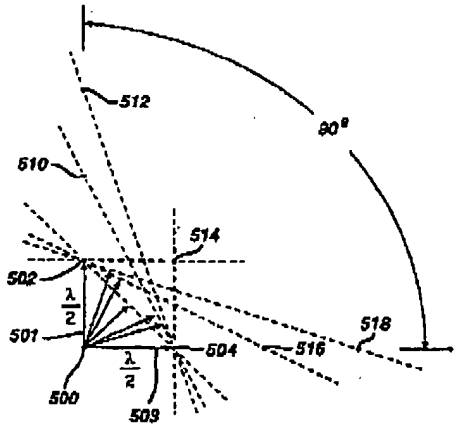
FIG. 1



FIGs. 1b and 1c likewise show iscosceles embodiments in which the stagger distance $S = \frac{1}{2}V$.

With Respect to Claim 7: Claim 7 recites that the first direction is tilted from a North direction by a tilt angle between 0 and 90 degrees. The Office Action indicates that this is discloses in FIG 1b as follows:

FIG. 1b

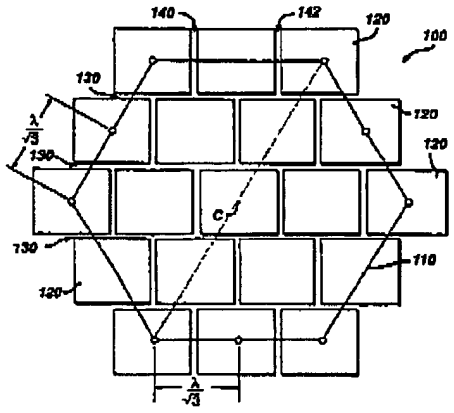


But this does not disclose a tilt angle of the array relative to North at all, but instead, angles between elements of the array.

With Respect to Claim 14: Claim 14 recites that the second row of elements is offset from the first row of elements in the first direction and that the third row of elements is offset from the first row of elements in the first direction according to a stagger distance S that varies as a random function of a distance from the first row of elements extending in a second direction perpendicular from the first direction. It does not appear as if this claim has been addressed.

With Respect to Claim 15-17: Claim 15 recites that the second row of elements is offset from the first row of elements in the first direction and that the third row of elements is offset from the first row of elements in the first direction according to a stagger distance S that varies as a non-linear function of a distance from the first row of elements extending in a second direction perpendicular from the first direction. The Office Action indicates that this is disclosed in FIG. 2 below:

FIG. 2



However, as shown on the blue line, FIG. 2 discloses a stagger distance that varies as a *linear* function of the distance between the first row of elements.

Claim 16 recites that the function proportional to a square function. This is likewise not disclosed.

Claim 17 recites that the angle of the first row of elements is tilted from the North direction ... the Fraser reference likewise does not mention this feature.

In paragraphs (6)-(7), the Office Action rejected claims 5, 6, 8-13, and 18 under 35 U.S.C. § 103(a) as being unpatentable over Fraser. The Applicant respectfully traverses these rejections as well.

With Respect to Claims 5, 6, 8-13, and 18: According to the Office action it would be a simple matter of design choice to choose the parameters listed in claims 5, 6, 8-13, and 18, and characterizes the parameters as a change of size. However, selection of these parameters is not simply a change in size. These parameter selections permit biasing asymmetrical grating patterns to avoid earth interference while maintaining the utilization efficiency. Accordingly, the Applicant respectfully traverses these rejections

VIII. Dependent Claims

Dependent claims 2-18 and 20-22 incorporate the limitations of their related independent claims, and are therefore patentable on this basis. In addition, these claims recite novel elements even more remote from the cited references. Accordingly, the Applicant respectfully requests that these claims be allowed as well.

IX. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicant's undersigned attorney.

Respectfully submitted,

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